

Appendix

Applicant has included additional background information in this Appendix. The background information provides clarification of those tomatoes mechanically harvested (i.e., process tomatoes) and those harvested manually (i.e., fresh tomatoes.)

Testing to predict tomato harvest worker performance

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Agricultural employees in general, and harvest workers in particular, usually are not hired through a careful selection process. Most get jobs on a first-come-first-hired basis. Harvest crews often develop into very skilled teams on which workers who are not productive drop out. In many other cases, however, wide ranges in crew member capabilities remain.

This study of a tomato harvest crew was conducted to determine whether a work-sample test, when workers would be doing their best because they know they are being studied, could be used to predict work performance when they do not think they are being observed. Such a test, if it helped to predict employee performance on the job, could be an improvement over chance-hiring and might result in the selection of fewer, more productive workers.

There are at least two reasons to hire workers carefully rather than hire indiscriminately and later fire those who do not work out. First, legally, it is a complicated process to fire workers. Second, and perhaps more important, no matter how poorly workers perform, mass-firing of the unsatisfactory workers may create morale and productivity problems among those who stay.

Benefits to the farmer from hiring fewer, more productive workers may include: (1) reduced paper work; (2) fewer supervisors needed; (3) lower overhead for costs not associated directly with performance (such as vacation, health insurance); (4) a stabilized work force as a result of increasing the length of the working season for those who are hired; (5) not having to pay the difference when workers do not pick enough to make minimum wage; and (6) less likelihood of workers setting very low production levels to avoid working themselves out of a job, protect slow workers from being embarrassed or fired, or prevent their employers from lowering the piece rate.

The study

This study took place in the summer of 1986 on a San Joaquin Valley farm, where the green tomato harvest is done by hand. Farm workers pick into two buckets, which they carry to trailers with bins; they are given a chip for every pair of buckets delivered and are paid according to the number of chips they collect in a day. To avoid possible damage to the tomatoes, picking cannot begin until the fruit is dry, so the

starting time varies with weather conditions.

The study used a "concurrent" test, in which the work of present employees during trial period(s) is compared with their work on the job. If such a test proved to be a valid indicator of employees' actual productivity, the testing procedure developed would then be used to test new applicants.

The study took place between 9:00 a.m. and 12:45 p.m. and consisted of three consecutive time periods: trial 1 (half hour); trial 2 (half hour), and a regular work period (about 2.5 hours). The goal was to determine if a statistically significant relationship could be established between the trial periods and the regular work period.

Workers were informed that this was an experimental test. Participation was voluntary. More than a hundred workers, mostly Hispanic, both men and women, and of widely varying ages, took part during one or more components of the study.

Participants were asked to pick tomatoes during two half-hour trial periods and count the chips (one chip for every two buckets) they collected during this time. The beginning and end of these half-hour periods were signaled by a shot from a starting gun. Picking began at about 9:00 a.m. Right after each of the two half-hour periods, each worker wrote his or her name and the number of chips collected for that period, on a card provided for this purpose.

A third group of chips was counted and reported by workers at around 12:45 p.m. They did not know their regular on-the-job performance was being measured during this period, until the last 15 minutes.

Results

Workers picked an average of 6.5 pairs of buckets during the first half hour, with a range of 3 to 12 pairs (table 1). Results of the second half-hour trial were the same. During the 2.5-hour regular work period, the average was 21.8 pairs of buckets, with a range of 8 to 41.

TABLE 1. Statistical analysis of trial results				
	Validity analysis		Buckets	
Trial	r	r²	Range	Mean
1	.44***	.20***	3 - 12	6.5
2	.57***	.33***	3 - 12	6.5

1 + 2	.55***	.30***	-	-
NOTE: Test trial correlated against job performance period (67 pairs).				
***p<.001 using Pearson's product-moment "r" and two-tailed table.				

Statistical analysis of trials 1 and 2, using data from 97 pairs of observations, resulted in a correlation of $r = 0.73$, indicating that the two half-hour work periods gave reliable (consistent) results.

Analysis of the test's validity in predicting performance on the job gave respectable results in comparison with other similar tests; in this analysis, using 67 pairs, each trial period and the combination of the two periods (table 1) were compared with the regular work period. The study results suggest that the use of a work-sample test could be an improvement over the chance hiring of tomato harvest workers.

Discussion

This study had limitations. One was the data collection process, in which workers filled out their own results and turned in cards stating how much they had picked in the time period. Also, the number of chips collected per worker reflected the number of bucket pairs turned in at the end of the half-hour test; partially filled buckets were not counted. Finally, it was difficult to control so many workers and demand precision in starting and ending each test period.

Several questions remain for future research: What results would be obtained by a test in which applicants were tested? How well would a short work-sample test such as this one predict performance of workers in other crops, such as strawberry workers, lettuce pickers, or grape pruners? How well can a test predict performance of hourly-paid crews?

A worker's performance is related to both ability and motivation. Prediction of on-the-job performance is difficult because it has to account for changes in ability and in motivation. It is likely, however, that workers who can pick 6 to 8 pairs of buckets an hour when they are trying their best will not be able to pick 15 to 20 pairs per hour, no matter what pay or other incentive is offered.

An employment test is only a partial predictor of performance. Once able workers are selected, the employer can then try to motivate them through effective supervision, incentive pay, worker involvement efforts, and the like.

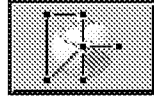
While this test for tomato pickers was successful in accounting for a portion of employee performance on the job, the validity of employment tests in other areas of agriculture still remains to be studied.

Thanks:

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Tomato harvest set to begin

by Dennis Patton, Horticulture Agent, Johnson County K-State Research & Extension

Early to mid-July is almost like heaven to a vegetable gardener. It is the start of the tomato season. All winter we have been subjected to the so-called tomatoes in the grocery store, but now the flavorful homegrown fruits are ready for the picking.

We have all enjoyed the vine-ripe flavor of fresh tomatoes from the garden, but does a tomato have to remain on the vine until it is completely ripe to develop that wonderful flavor? The answer is, no.

Although many will debate this answer, it is true from a scientific standpoint. What has happened over the years is we have been conditioned to relate taste with ripening on the vine. This is because of the poor flavor and quality of greenhouse tomatoes. Following is the process in the development of a so-called vine-ripe fruit.

When a tomato reaches full size it becomes pale green. This is when the ripening process starts which is regulated by an internal gas produced within the fruit called ethylene. When the tomato reaches the breaker stage, when it is about half green and half pinkish-red, a layer of cells form across the stem of the tomato sealing it off from the main vine. When this occurs there is nothing that can move from the plant into the fruit. The tomato can be harvested and ripened off the vine with no loss of flavor, quality or nutrition.

Harvesting at the breaker stage offers several advantages to a tomato grower. It lightens the fruit load on the plant, reducing the chance of cracking or fruit damage, and also allows the grower to control the ripening process.

One common tomato problem in Kansas during summer is the heat. Temperatures over ninety-five degrees decrease the development of the red pigments, resulting in an orange-red fruit.

Picking and ripening indoors allows you to control the ripening, thus the supply that needs to be used at one time. Tomatoes held at cooler temperatures will ripen slower. You can speed up or slow down the process by raising the temperature to an optimum eighty-five degrees or lowering to a minimum of fifty degrees.

Harvesting a vine-ripe tomato may give us the feeling of picking the perfect fruit, but it is not necessary for a flavorful harvest. Just remember that tomatoes develop their optimum flavor, nutrition, and color when they are in the full red ripe stage, but this does not have to occur on the plant.

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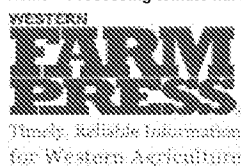
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Processing tomato harvest moving to high gear

Aug 6, 2005 9:45 AM, By Harry Cline, Farm Press Editorial Staff

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Giant mechanical tomato harvesters are lumbering through more than a quarter million acres of California processing tomatoes, gathering vines and separating green tomatoes from red ones.



When the final gondola truck is pulled from the field this fall, the crop should total about 10 million tons of tomatoes to be processed into everything from canned diced tomatoes to ketchup to Marinara sauce in your favorite Italian restaurant.

Evidence is accumulating California's 2005 processing tomato harvest is well under way. Roadsides from Ekersfield to Woodland between now and October will be littered with thousands of tomatoes that made it to the gondolas from the harvesters only to roll off en route to the cannery.

Unfortunately, there is very little cause for optimism as this year's tomato harvest gears up. Prices remain flat like those tomatoes that rolled into the roadway to be flattened by passing cars and trucks. Adding to the pain is added expenses growers have incurred growing this year's crop. Weed and disease control costs have been excessive.

For two decades until the turn of the century, a cannery tomato contract was a license to print money. You could not pry a tomato contract away from a grower who had one. A lot of money was made on tomatoes in the 1980s and 90s. Today cannery tomato contracts go begging for takers because there is little or no profit in growing processing tomatoes. The industry's ability to grow and process massive tons has created a situation where supply can be limitless and demand limited. Plus, there are so few buyers of raw products, there is little price competition in the wholesale market. It is the same buyer consolidation issue that is facing most California commodities. This adds up to perpetually low prices.

Tomato contracts have been stuck on \$50 per ton for so long it has become like a recorded telephone message that never changes. Growers are tired of hearing it.

Even during the good times, contract prices were not really much higher than today's price. However, producers have made huge strides in increasing yields with one innovation and one new variety after another. Ten years ago a 30-ton per acre crop was something to brag about at the coffee shop. Today 80 tons is a disappointment. Yields of 50 to 60 tons are not uncommon in specific fields.

Costs eat tonnage

Growers admit there is still room at the top for more yield, but costs are eating away at added tonnage faster than producers can add extra pounds per acre.

The 265,000 acres planted this year are the third lowest planted in the past 15 years, an indication that growers are giving up on a crop that once represented a solid return on investment. Only 1982 and 2001 acreages were lower.

California's annual 10 million tons represents 95 percent of the processed tomato products produced in the U.S. However, the chairman of the California Tomato Growers Association (CTGA), Fresno County producer Don Cameron, says unless the economics for growers change soon, tonnage will fall sharply, and there may not be enough tomatoes grown to support the state's canneries.

The processing tomato industry could go the way of the state's garlic industry, virtually defaulted to China and other offshore low cost producers, unless something changes.

"That would be a sad state of affairs," admits Cameron. "We produce a healthy, high quality food product in California that is good for the American consumer. If the U.S. loses it and is forced to rely on other countries for tomato products, that raises concerns about food safety and food security."

Cameron said "we produce the finest tomato product in the world. It is unfortunate we cannot receive enough to keep our product economically viable.

"We've done just about everything we can to cut costs. We cannot always have a big production year like last year to absorb some of the costs. This year is a good example of costs exceeding income," said Cameron.

The tomato growers association, for years a bargaining association, has shifted its focus from negotiating price to generate support and funds to create demand-increasing promotions for tomato products. Growers believe that is the only way out of the economic malaise. The association has made it clear it wants canneries and growers to join together and create demand for tomato products like almond growers have done for their commodity.

CTGA president Ross Siragusa said most growers are in favor of spending money to promote the health aspects of tomato products. However, the "brand" processors are reluctant to spend while other bulk processors are taking a wait and see attitude. It is a familiar story. Many commodity groups have faced the same dilemma in difficult economic times.

Processors Conagra, Ingomar, Los Gatos, Morningstar and Pacific Coast Producers "have indicated their interest in supporting an industry wide effort," said Siragusa, who continues to pound doors for more support.

Same leaky boat

He acknowledges that processors are in the same leaky economic boat as producers. No one is getting rich growing, processing or marketing processing tomatoes.

"Some may argue that economics are so tough that no one can afford to contribute towards promotion," Siragusa said. "That is the same argument some almond growers used in the '90s." The almond industry leadership moved forward anyway and almond demand has soared along with grower prices.

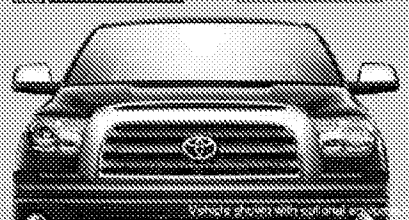
"We have even more going for us now with a positive health message than the almond industry did when it started promoting," said Siragusa.

Long term promotion is a long term solution, believes Cameron and Siragusa.

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However, there is a more immediate economic crisis: the 2005 crop. Diseases, primarily bacterial speck, forced growers to repeatedly treat with fungicides in the wake of a prolonged wet spring. Those who did not treat aggressively have lost tonnage. Disease control expense has been compounded by a big weed control cost year.

"Some years are buggy years. Others are weedy years. This is the weedy year," said Kevin Lehar of Woolf Enterprises, Huron, Calif.

"We saw nightshade blooming in January. We do not typically see that until early March."

When Lehar would tackle the weed problem on the 5,600 acres of tomatoes he managed with an herbicide application, there would be more showers and more weed flushes.

"The rain pattern was ideal for the weeds," he said.

Compounding the issue is growing weed resistance to herbicides. Marehail is now officially resistant to glyphosate. Lehar believes lambsquarter will soon be added to the resistance list. It is not just glyphosate resistance that has Lehar concerned. Pigweed is getting harder to control with preplant dinitroanilines. "We used to get lambsquarter with dinitroaniline. That is no longer the case," he said.

Disease problems

The same cool, wet spring that spawned the weeds, also caused disease problems. Lehar treated an average of four times for bacterial speck. He normally treats once or maybe twice.

"We plant resistant varieties, but there is a new race of speck that is causing a lot of problems," said Lehar. "We treated more aggressively than in the past. We have been hurt badly by speck in the past. If we error, we want it to be on the side of caution."

Some growers operated on the assumption that the rains would eventually stop and held off preventive fungicide treatments. Rain did not stop until May. Yield was lost in many fields due to bacterial speck.

Another, growing problem is tomato spotted wilt, a thrips-vectored disease for which there is no control. An estimated 1,000 to 2,000 acres were disked under early in the San Joaquin Valley due to tomato spotted wilt.

"Yields will definitely be lower this year. We will be lucky to have a normal year," said Cameron. The cool, wet spring delayed planting for many. Processing tomatoes are still mostly contracted and planted on a schedule to meet cannery delivery dates. Those dates are met, regardless of the tonnage from the field.

The May 30 crop estimate was for 10.4 million tons. Siragusa called 10.3 "optimistic." The California Agricultural Statistics Service estimated crop tonnage yield is based on an average of 39.5 tons per acre, which would be the second highest average. Siragusa expects the August crop estimate to be lower.

Foliar diseases

Gene Miyao, UC Cooperative Extension farm advisor in Yolo County, said foliar diseases caused by spring rains "took away tons from early plantings" in the Southern Sacramento Valley.

"I cannot recall a year during my career when bacterial speck was as bad as this year. It is not in every field, but it was pretty widespread," said the veteran farm advisor.

Early-planted fields were hit hardest with diseases and other problems. Later-planted fields look better. However, the better fields ran head long into a string of 100-degree days in mid-July that cause sunburn and may push fields "over the hill," said Cameron.

"Some fields look decent, but there is no bumper crop overall," said Siragusa.

Lehar considers Woolf fortunate. He believes the farm's tomato acreage is better than most. "However we are a full season grower, and we will be harvesting well into the fall. The season is a long way from over," he said. The biggest challenge is to maintain yield for late harvest tomatoes which have to face excessive heat during fruit set and powdery mildew problems.

He dodged spray drift that was a widespread problem in the valley this season and aggressive bacterial speck treatments prevented major disease problems. Overall, his crop is only about 10 days late. That is not bad considering the lousy spring conditions.

"Fortunately, we have some sandy ground we were able to get in and plant on a timely schedule," he said. He started planting the third week of January.

More transplants

"We doubled our transplant acreage and we will add more next year," he said.

It costs about \$45 per acre more to use transplants, but Lehar gets a stand. It takes 15 to 20 days to get a stand with direct seeding under ideal conditions. Rain and wet weather can set that back.

Plus, seed for open pollinated varieties is becoming increasingly more expensive.

More use of transplants is part of Woolf's efforts to meet the challenge of making a profit from \$50 per ton tomatoes by continually striving for higher yields. Woolf also has reduced tomato acreage to maximize yield. "We have been as high as 10,000 acres of tomatoes, but we pared that down to do a better job of managing tomatoes without being overextended."

Like many SJV farmers, Lehar is cutting costs by reducing tillage operations. Woolf has also joined the drip irrigation parade. Drip is nothing new, but there is a growing trend toward above ground drip systems rather than buried drip.

For one thing it costs less; \$250 to \$350 per acre versus \$1,000.

Above ground systems also gives producers more flexibility in irrigating the crop and managing equipment over different row configurations.

"We jumped in with both feet going from 15 acres to 45 acres to 3,000 acres to 7,000 acres of drip this season." It is mostly in tomatoes, although he has gone from 45 acres of drip irrigated garlic last year to 150 this year. If garlic yields pan out like he expects there will be more drip-irrigated garlic. "We are trying it on 450-acres of cotton this year. Last year we had it on 60-acres of cotton," he said.

Lehar has not seen real water savings with drip versus sprinklers or other forms of irrigation, but there is a definite yield advantage with the uniformity of drip.

Cotton, garlic and tomatoes are the row crop mainstays for Woolf. The family farming operation also has small lettuce acreage each year.

The above ground drip tape is only 8 mil, however, Lehar said it has proven to be a tough, lightweight irrigation system. "We had to run a tractor over some of it and it held up well."

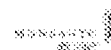
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it is designed to be disposable and recyclable each season. "We are trying some this year to see how it does over two years of use," he said.

"Above ground drip has really exploded on the West Side," he added.

Woolf is locked into the tomato business due the family's partnership in Los Gatos.

However, tomatoes have long been part of the Woolf row crop rotation before the cannery partnership was formed. "If you do not grow tomatoes, what do you grow?" he said.

Some growers have answered that question by planting alfalfa. Others have switched to permanent crops like vines and trees, specifically almonds and pistachios.

Miyao acknowledges that there is growing interest in switching from tomatoes to alfalfa or trees and vines in his area. However, many tomato growers remain committed to the crop because it offers at least an opportunity to significantly increase income through efficiency and innovation.

"If you grow 3-ton wheat and with closer management become a 4-ton wheat grower, you are talking about an added \$100 in gross income," said Miyao.

On the other hand, if a producer is getting 40 tons of tomatoes per acre and can elevate that to 45 tons with new technology or other advances the five extra tons represents a \$200 per acre increase in revenue.

And, if growers can protect that added income by cutting costs through reduced tillage, precision agriculture, drip irrigation or other new technologies, he can be part of what Miyao believes will be a strong core industry that will survive in the long term.

"Committed growers are making investments in technology to try and squeeze out extra dollars from already thin profit margins. They are gearing up for now as well as the future and banking on a improve efficiency and increase yields to capture the benefits of tomatoes over the longer term," he said.

Lehar and Woolf are among those growers. It has been a tough season so far, but the extra effort leads Lehar to say: "I am satisfied where we are at this point in the season."


With the reduced acreage and production problems, it is unlikely the 10.3-million-ton cannery contract intentions will be met.

Overall demand for paste products is up 12 percent and with a projected total disappearance projected at 11.75 million tons, this will put ending inventory under 4.1 million tons, below the past five year average.

That would seem to be a good omen for a turnaround in prices. However, there is resistance in the marketplace to accept higher prices, and there are reports of paste sales for 2006 not much better than this season.

One short tonnage season does not make a turnaround in prices. Grower leaders of the industry believe only dramatic increases in consumption will raise income level for growers and processors.

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